BURROWING OWL
Athene cunicularia

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Management Status: Federal: USFWS Species of Concern; BLM Sensitive
California: Species of Special Concern (CDFG, 1998)

General Distribution:

Burrowing Owls breed from south central Canada south through most of the western United States and Central America to the southern tip of South America, as well as in Florida and on most of the larger Carribbean islands (Haug et al., 1993). In North America, northern populations withdraw irregularly southward in winter (Zarn, 1974), corresponding with anecdotal evidence of a slight winter influx in the southwest and Mexico (Coulombe, 1971). Populations breeding in northern Arizona are apparently migratory (Phillips et al., 1964), while those breeding in California and southern Arizona are largely non-migratory (Thomsen, 1971; Haug et al., 1993).

A tendency for coloniality, with large intervening areas unoccupied (Zarn, 1974; pers. obs.), probably reflects the patchy distribution of available habitat. Dispersal of young and seasonal migration account for occasional appearances nearly anywhere within the species' general range.

Distribution in the West Mojave Planning Area:

There is virtually no published literature on details of distribution or seasonal movements for this species in the Mojave Desert. Garrett and Dunn (1981) give an overview of the species' distribution in southern California deserts: "It is quite scarce on the northern deserts from the e[east] Mojave Desert north through Inyo Co. . . . While it is largely resident in the region, there is some winter movement of more northerly birds into the southern and coastal parts of the region. . . . The Burrowing Owl reaches peak abundance in agricultural areas in the Imperial Valley; the banks of irrigation ditches provide suitable nesting sites. Open desert scrub is widely but sparsely inhabited."

There is no published evidence regarding partial or complete withdrawal in winter by breeding birds in the Mojave Desert, though such a pattern may occur at least in the northern portions of the WMPA. The seasonality, magnitude and geographic pattern (if any) of the apparent winter influx from more northerly breeders is also poorly documented. It is likely that some information on these patterns exists in widespread, unpublished data from many individual observers.

Existing records of Burrowing Owls compiled for this account includes 53 records within the WMPA. The records on hand certainly represent only a small sample of the locations at which Burrowing Owls have recently been or currently are present. Of the 53 records, 23 (43%) are from within Edwards Air Force Base; all of these have no specific locale or date. Of the other 30 records, only 13 have specific locales and dates. Probable or confirmed breeding was noted at five locales (as mapped).

Natural History:

Most data available on this species are from studies in Florida, Pacific coastal areas, and the Great Plains (e.g., Thomsen, 1971; Butts, 1973; Ross, 1974; Green, 1983; and others cited in Haug et al., 1993). Studies in desert areas include Coulombe (1971), Martin (1973), Barrows (1989), and Silva et al. (1995), although there are apparently no thorough or long-term published studies of this species in the Mojave Desert. The information presented here is based primarily on existing desert studies, along with compiled information in Haug et al. (1993).

Burrowing Owls are one of only two North American owls showing no reverse sexual size dimorphism, with males slightly larger than females (Voous, 1988) or similar in size (Plumpton, 1992, cited in Haug et al., 1993). Based on combined studies, Burrowing Owls in western North America averaged 172.0 g. (males) and 168.0 g. (females; Voous, 1988). Mean longevity in desert areas is unknown. In coastal California, apparent survival rates in a banded population were 30% for juveniles and 81% for adults (Thomsen, 1971). Oldest known age for a non-captive Burrowing Owl is 8 years and 8 months (Kennard, 1975).

This distinctive owl is active both day and night, but is generally most active near dawn and dusk (Zarn, 1974). The nesting season begins in early March in the Imperial Valley (Coulombe, 1971) and slightly later in the more strongly seasonal desert of New Mexico (Martin, 1973). The breeding season in coastal southern California (Ventura County to San Diego County) was found to extend from early April through late June (n=55; Kiff and Irwin, 1987). Fledglings appear to reach independence in August and September (Martin, 1973), although in non-migratory populations this may be a more gradual process. Burrowing Owls appear to be predominantly seasonally monogamous in migratory populations (Martin, 1973), while in non-migratory birds pair bonds often continue year-round (Haug et al., 1993). In the western United States pairs produce only a single brood per year, but will re-nest in response to early nest failures (Haug et al., 1993). Genetic work by Johnson (1997) revealed that in 20% of cases in one population in Davis, California, genetically determined parent-offspring relationships and those suggested by direct behavioral observations disagreed. Causes were nestling movement and brood mixing, extra-pair fertilization, polygamy, and possibly intraspecific brood parasitism.

Burrowing Owls in the western United States are only rarely known to construct their own burrows, in contrast to those in Florida (Haug et al., 1993). Many researchers and observers have noted a strong association between Burrowing Owls and burrowing mammals, especially ground squirrels (*Spermophilus* spp.). Soils suitable for burrows may limit distribution in natural areas, however the species will also occupy man-made niches such as banks and ditches, piles of broken concrete, and even abandoned structures (Haug et al., 1993).

Literature on Burrowing Owl diet is extensive but mostly anecdotal (e.g., Robertson, 1929; Bond, 1942; Longhurst, 1942; Carson, 1951; Glover, 1953). They are usually described as dietary generalists, with arthropods composing the majority of prey items. Both Barrows (1989) and Coulombe (1971), studying the species in California deserts, noted a prevalence of earwigs (Dermaptera). A wide variety of invertebrates and vertebrates have been noted in diets, with some indications that prey are taken approximately in proportion to availability.

Habitat Requirements:

Grinnell and Miller (1944) describe habitat in California as, “Open, dry, nearly or quite level, grassland; prairie; desert floor.” Several factors in combination may explain the species’ distribution within the Mojave Desert: vegetation density, availability of suitable prey, availability

of burrows or suitable soil, and disturbance (primarily from humans). In a few areas, predation may be an important factor.

Few desert areas have too much plant cover for Burrowing Owls; where they do (e.g., palm oases), they are unoccupied (e.g., Barrows, 1989). Dense vegetation probably may not exclude Burrowing Owls directly, but rather through increased predation or competition, or lowered hunting success for preferred prey. As reported in Voous (1988), "Of all North American owls examined experimentally, the Burrowing Owl showed the least ability to locate immobilized prey in the dark (Dice, 1945; Marti, 1974) . . . corresponding with the same ability to see in dim light as man."

Local and regional prey availability may be an important factor in habitat suitability, and thus distribution. For example, several researchers have found that the proportion of mammalian prey increases in winter (Haug et al., 1993), and Barrows (1989) noted that in the Mojave Desert the most common pocket mouse (*Perognathus longimembris*) hibernates during winter, while those to the south in the Colorado Desert do not, and more species are present as well. Prey abundance was not reported.

Human alteration of the landscape can inadvertently or intentionally create suitable habitat, while many kinds of human actions can also make potential habitat unsuitable. Low-intensity agriculture and surface irrigation probably create habitat by providing burrow sites and prey. However, harmful human alterations can cause loss of habitat either by decreasing prey (e.g., through urban development or pest eradication), decreasing burrow availability (e.g., eradication of ground squirrels and other fossorial mammals), degrading habitat quality (e.g., excessive noise or disturbance; invasion by exotic plants), or increasing mortality risk (e.g., through on- or off-road vehicle collisions, non-native predators such as dogs and cats). Much remains to be learned about the kinds of habitat alteration tolerated by this species, including noise impacts as well as duration and daily timing of nearby human activities.

Population Status:

Trends in populations of Burrowing Owls in the United States and Canada were recently summarized by James and Espie (1997), who relied on responses to a questionnaire mailed to the 24 states and provinces in which the owl breeds. The California Department of Fish and Game response indicated that the California population total was between 1000 and 10,000 pairs, that there was a declining trend, and that factors in the decline included habitat loss, pesticides, predators, persecution, reduced burrow availability, and vehicle collisions.

Information available on the species status and distribution in the Mojave Desert (e.g., Garrett and Dunn 1981; data mapped for this account), along with known trends in habitat changes, indicate that the species is currently uncommon, local or patchy in occurrence, and currently in slow decline, but is not yet threatened with extirpation. The total breeding population within the WMPA is likely in the range of a few hundred pairs.

Threats Analysis:

The following factors are known threats in some portion of the range, and are potential threats in the WMPA: direct mortality from man (including vehicle collisions); pesticides; habitat degradation, destruction and loss; and predators.

Haug et al. (1993) state that, "collisions with vehicles [are] often a serious cause of mortality," citing several studies in which this was documented as being significant. This may be

in part due to the relatively high tolerance of the species for vehicular disturbance (Plumpton and Lutz, 1993; Coulombe, 1971), along with a preference for roads and flat, open spaces. Direct mortality by shooting has been documented by multiple researchers in recent times in Canada and Oklahoma (Wedgwood, 1978 and Butts, 1973, both cited in Haug et al., 1993), and is a likely cause of at least limited mortality in the Mojave Desert (Zarn, 1974), where target practice (legal and illegal) is common.

Pesticide use (i.e., not intended for Burrowing Owls) has clear adverse effects on Burrowing Owls due to direct mortality, loss of animals that provide burrows, and loss of prey base (James and Fox, 1987, cited in Haug et al., 1993). Alternative pest management strategies may be possible, though research on California Ground Squirrels, *Spermophilus beecheyi*, (Van Vuren et al., 1997) indicates trapping and relocating is not a useful management alternative for problem ground squirrel colonies in most instances.

Human alteration of the landscape, including urbanization, mining, trash disposal and other uses, is a direct source of habitat loss for this species. However the more subtle process of habitat degradation, through grazing (Haug et al., 1993), invasion of non-native plants, alteration of flood patterns through flood control, erosion, and other subtle changes, also reduces the amount of suitable habitat. All of these factors are well-established for Burrowing Owls in coastal California (Haug et al., 1993; Hamilton and Willick, 1996), but already occur and can be expected to increase in desert areas as a result of continuing regional human population growth.

Maintenance and brush control of irrigation ditches can exert a major influence on Burrowing Owl populations in some areas. As Zarn (1974) notes, "Too frequent control disrupts colonization by ground squirrels; too little control allows vegetation to grow too tall for ground squirrels' habitat preferences. In either case, resultant burrow availability affects the owls."

In one study, food supplemented females laid more and larger eggs and hatched more young than those not supplemented, providing one explanation for poor reproductive success in areas where human activity reduces habitat quality (Wellicome, 1992, cited in Haug et al., 1993). Another factor affecting productivity was revealed by a study in Florida, where as many as 27% of nests with eggs and young chicks failed in some years due to collapsing burrows caused by spring rains (Millsap and Bear, 1988, cited in Haug et al., 1993); trampling by sheep in grazing areas has also been known to cause widespread collapse of burrows (Haug et al., 1993). Some populations may be threatened by changes in prey availability; in one study in Chile (Silva et al., 1995), it was shown that rodent prey was a limiting factor for populations there, even though most food items were arthropods.

A wide variety of mammalian and avian native predators are known; Badger (*Taxidea taxus*) especially seems to be a potentially serious local problem (Haug et al., 1993), but is rarely a threat except where native predators have increased as a result of changes by man, for example with Coyote (*Canis latrans*) or Great Horned Owl (*Bubo virginianus*). Non-native predators, especially Domestic Dog (*Canis familiaris*) and Domestic Cat (*Felis domesticus*) are known predators of adult and young Burrowing Owls, and may be serious problems in some areas of the WMPA.

Biological Standards:

No hard data exists on population size, structure or trends within the Mojave Desert. Recent recommendations for survey methods (Haug and Didiuk, 1993; CBOC, 1993; CDFG, 1995; CBOC, 1997) provide a basis only for determining presence or absence, limiting their use in

assessing population changes over time. The only published, quantitative census technique specifically for Burrowing Owls was developed by Martell et al. (1997), and uses a point-transect survey method and an area occupied analysis. This method is probably the most practical technique for assessing numbers of owls in small to moderate-sized areas for baseline management, to evaluate impacts from land use changes and for monitoring restoration success. Based on existing studies of population parameters and trends (e.g., James et al., 1997), five-year surveys should be adequate to indicate trends in most populations.

In the short term, the primary conservation needs for Burrowing Owl in the WMPA are to lower mortality from vehicle collisions, both on and off of roads, and to protect them against shooting and harassment. In the longer term, it is vital to protect and maintain the species' habitat, both through not harming populations of ground squirrels and other fossorial mammals, and through active conservation of both occupied and potentially occupied areas. Mitigation recommendations provided in CDFG (1995) should be followed for all projects in the WMPA, as a minimum.

Based on existing information on Burrowing Owls and existing land uses and trends within the WMPA, minimum management requirements in the WMPA should include at least the six steps below to minimize additional declines, and to address specific problems that are likely to exist locally. These are: (1) limit vehicle speeds on secondary and back roads in areas of occupied and potential Burrowing Owl habitat; (2) prohibit off-road vehicles in areas of occupied and potential Burrowing Owl habitat; (3) prohibit use of biocides or other toxins as well as shooting or trapping for pest control in occupied and potential Burrowing Owl habitat; (4) educate recreational users in the area as to the penalties for killing or harassing Burrowing Owls, and the benefits of their presence (e.g., pest control, public enjoyment and education); (5) require surveys for this species in all areas of potential habitat prior to undergoing any planned change (e.g., road or other construction, changing land use such as grazing or vehicle access); and (6) maintain an ongoing database of sensitive species information for the WMPA, made available upon request by researchers.

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